

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 110164:LJBG:sp	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).	
International Application No. PCT/AU2003/001439	International Filing Date (day/month/year) 30 October 2003	Priority Date (day/month/year) 30 October 2002
International Patent Classification (IPC) or national classification and IPC Int. Cl. ⁷ H04B 10/17, H01S 3/102		
Applicant EDITH COWAN UNIVERSITY et al		

This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

- ☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheet(s).

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☒ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☒ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 27 May 2004	Date of completion of the report 8 February 2005
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer MICHAEL HALL Telephone No. (02) 6283 2474

I. Basis of the report

1. With regard to the elements of the international application:*

- ☒ the international application as originally filed.
- ☐ the description, pages , as originally filed,
pages , filed with the demand,
pages , received on with the letter of
- ☐ the claims, pages , as originally filed,
pages , as amended (together with any statement) under Article 19,
pages , filed with the demand,
pages , received on with the letter of
- ☐ the drawings, pages , as originally filed,
pages , filed with the demand,
pages , received on with the letter of
- ☐ the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , received on with the letter of

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig.

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
- ☐ paid additional fees.
- ☐ paid additional fees under protest.
- ☐ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is:

- ☐ complied with.
- ☒ not complied with for the following reasons:

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion this Authority has found that there are different inventions as follows:

1. Claims 1-29, 31 are directed to an optical amplifier wherein pump beams are generated by a vertical cavity surface emitting laser. It is considered that the *use of a vertical cavity surface emitting laser to generate the pump beams* comprises a first "special technical feature".
2. Claims 30, 32 are directed to a method of controlling optical amplifier gain, by processing signals related to measured signal and pump powers to generate a corresponding pump source driving profile. It is considered that *processing signals related to measured signal and pump powers, to generate a corresponding pump source driving profile*, comprises a second "special technical feature".

The feature common to all of the claims is an optical amplifier having a pump source, with amplification of signals via stimulated emission induced by pump beams. However this common feature is generic in the art of fibre amplifiers. Consequently the common feature does not constitute "a special technical feature" within the meaning of PCT Rule 13.2, second sentence, since it makes no contribution over the prior art. Since there exists no other common feature which can be considered as a special technical feature within the meaning of PCT Rule 13.2, second sentence, no technical relationship within the meaning of PCT Rule 13 between the different inventions can be seen. Consequently it appears that a posteriori, the claims do not satisfy the requirement of unity of invention.

Furthermore, the groups of claims include distinct classifications under the IPC (eg, H01S 5/183 in relation to the first group of claims, and H01S 3/102 in relation to the second group of claims) and therefore constitute separate search areas, and hence the International Search Authority considered that these inventions could not be searched without involving significant extra effort. The additional search fee requested was paid by the applicant, and hence all claims were searched.

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☒ all parts.
- ☐ the parts relating to claims Nos.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 3, 5, 7-15, 19-29, 31-32	YES
	Claims 1-2, 4, 6, 16-18, 30	NO
Inventive step (IS)	Claims 3, 5, 8-9, 20, 22-29, 31-32	YES
	Claims 1-2, 4, 6-7, 10-19, 21, 30	NO
Industrial applicability (IA)	Claims 1-32	YES
	Claims	NO

2. Citations and explanations (Rule 70.7)

Citations

D1 : WO 2001/067563

D2 : US 5301201

D3 : US 2002/0027706

D4 : US 6407854

NOVELTY (N) claims 1-2, 4, 6, 16-18, 30

Claim 1: Each of D1 teaches use of one or more vertical cavity surface emitting lasers to generate pump beams for an optical fiber amplifier (eg, pages 3, 19-21 and claims 29-31 of D1; columns 2-4 and Figure 4 of D2). It is intrinsic to the operation/function of such amplifiers to have waveguide means for receiving input optical signals which are amplified via stimulated emission provided by the pump beams. Hence all features of claim 1 are disclosed by each of D1 and D2, and therefore this claim is not novel.

Claim 2: It is intrinsic to the operation of optical fiber amplifiers to use optical fibres and optical fibre couplers for routing means, as per the additional features of this claim (see also Figure 4 of D2), and hence claim 2 is not novel in the light of each one of D1 and D2.

Claims 4, 6: All additional features of these claims are disclosed by D1, where a lens acts a focussing means and an optical coupler or fibre as a collimating means (eg, page 19), and hence these claims are not novel.

Claims 16-18: D1 discloses all features of these claims (eg, pages 3, 19), and hence these claims are not novel.

Claim 30: D3 teaches control of a pump source, for controlling the optical gains of an optical amplifier, via processing detected signal power and pump power signals, as per this claim (eg, paragraphs 27-33 and Figure 1 of D3). Hence this claim is not novel in the light of D3.

INVENTIVE STEP (IS) claims 1-2, 4, 6-7, 10-19, 21, 30

Claims 1-2, 4, 6, 16-18, 30: as above. It is further considered that claims 4, 6, 16 and 17 lack an inventive step in the light of D2, as the additional features of these claims represent obvious selections for carrying out the teachings of D2.

Claim 7: Monitoring the signal and pump powers is to be an obvious selection for controlling the operation of the optical amplifiers of D1 and D2, requiring no inventive step to implement.

Continued

VI. Certain documents cited

1. Certain published documents (Rule 70.10) --

Application No. Patent No.	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
P,X US 2003/0112498	19 June 2003	13 December 2001	13 December 2001

This citation teaches all features of claims 1-4, 6, 12-14 (eg, paragraphs 17-23, Figure 3), and hence these claims are not novel in the light of this citation.

2. Non-written disclosures (Rule 70.9)

Kind of non-written disclosure	Date of non-written disclosure (day/month/year)	Date of written disclosure referring to non-written disclosure (day/month/year)

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of Box V

Claims 10-15: Use of the pump means disclosed in D1 and D2 for a multi-port optical amplifier is considered to be an obvious application of the teachings of these citations, requiring no inventive step to implement.

Claims 19, 21: Each of D3 and D4 teach detecting pump beam and signal beam powers of an optical amplifier for controlling the pump beam (eg, page 2 of D3 and columns 5-6 of D4), and hence it is obvious for a person skilled in the art of such amplifiers, wishing to control the pump beams of the amplifiers of either of D1 or D2, to use the teachings of either D3 or D4 as per these claims. Hence these claims are not inventive in the light of an obvious combination of any one of D1 and D2 with any one of D3 and D4.

Note that no obvious combination of the prior art teaches or suggests a microlens array as per claim 5; nor a two-dimensional photodetector array as per claims 8-9, 20 and 22; nor the detailed arrayed configuration as per claims 23-29, 31-32. Hence these claims are considered to be novel and inventive over the prior art.

With regard to the document(s) listed in Box VI under "certain documents cited", these are documents published prior the international filing date but later than the priority date claimed but which would otherwise be considered to be of particular relevance.

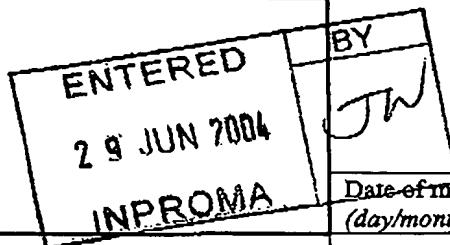
Under the PCT, novelty is considered only in respect of documents published before the priority date. The relevance of a document published after the priority date is dependent upon national law. Such documents are excluded from consideration in preliminary examination, under the PCT Guidelines but have been included here for information.

PATENT COOPERATION TREATY

From the:
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

WRAY & ASSOCIATES
Level 4 The Quadrant
1 William Street
PERTH WA 6000



PCT
WRITTEN OPINION
(PCT Rule 66)

Date of mailing (day/month/year) 29 JUN 2004

Applicant's or agent's file reference
110164

REPLY DUE within **TWO MONTHS**
from the above date of mailing

International Application No.
PCT/AU2003/001439

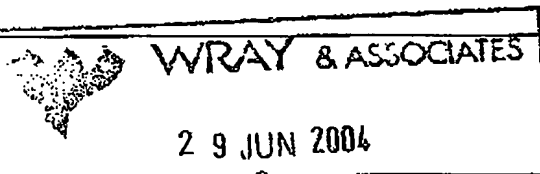
International Filing Date (day/month/year)
30 October 2003

Priority Date (day/month/year)
30 October 2002

International Patent Classification (IPC) or both national classification and IPC
Int. Cl. ⁷ H04B 10/17, H01S 3/102

Applicant

EDITH COWAN UNIVERSITY et al



1. This written opinion is the **first** drawn by this International Preliminary Examining Authority.

2. This opinion contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☒ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability, citations and explanations supporting such statement
- VI ☒ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

3. The **FINAL DATE** by which the international preliminary examination report must be established according to Rule 69.2 is:
28 February 2005

4. The applicant is hereby invited to reply to this opinion.

When? See the Reply Due date indicated above. However, the Australian Patent Office will not establish the Report before the earlier of (i) a response being filed, or (ii) one month before the Final Date by which the international preliminary examination report must be established. The Report will take into account any response (including amendments) filed before the Report is established. If no response is filed by 1 month before the Final Date, the international preliminary examination report will be established on the basis of this opinion.

Applicants wishing to have the benefit of a further opinion (if needed) before the report is established should ensure that a response is filed at least 3 months before the Final Date by which the international preliminary examination report must be established.

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also For an additional opportunity to submit amendments, see Rule 66.4. For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4bis. For an informal communication with the examiner, see Rule 66.6.

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Authorized Officer

MICHAEL HALL
Telephone No. (02) 6283 2474

I. Basis of the opinion

1. With regard to the elements of the international application:*

- ☒ the international application as originally filed.
- ☐ the description, pages , as originally filed,
pages , filed with the demand,
pages , received on with the letter of
- ☐ the claims, pages , as originally filed,
pages , as amended under Article 19,
pages , filed with the demand,
pages , received on with the letter of
- ☐ the drawings, pages , as originally filed,
pages , filed with the demand,
pages , received on with the letter of
- ☐ the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , received on with the letter of

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the written opinion was drawn on the basis of the sequence listing:

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig.

5. ☐ This opinion has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed"

IV. Lack of unity of invention

1. In response to the invitation (Form PCT/IPEA/405) to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
- ☐ paid additional fees.
- ☐ paid additional fees under protest.
- ☐ neither restricted nor paid additional fees.

2. This Authority found that the requirement of unity of invention is not complied with for the following reasons and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees:

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion this Authority has found that there are different inventions as follows:

1. Claims 1-29, 31 are directed to an optical amplifier wherein pump beams are generated by a vertical cavity surface emitting laser. It is considered that the *use of a vertical cavity surface emitting laser to generate the pump beams* comprises a first "special technical feature".
2. Claims 30, 32 are directed to a method of controlling optical amplifier gain, by processing signals related to measured signal and pump powers to generate a corresponding pump source driving profile. It is considered that *processing signals related to measured signal and pump powers, to generate a corresponding pump source driving profile*, comprises a second "special technical feature".

The feature common to all of the claims is an optical amplifier having a pump source, with amplification of signals via stimulated emission induced by pump beams. However this common feature is generic in the art of fibre amplifiers. Consequently the common feature does not constitute "a special technical feature" within the meaning of PCT Rule 13.2, second sentence, since it makes no contribution over the prior art. Since there exists no other common feature which can be considered as a special technical feature within the meaning of PCT Rule 13.2, second sentence, no technical relationship within the meaning of PCT Rule 13 between the different inventions can be seen. Consequently it appears that a posteriori, the claims do not satisfy the requirement of unity of invention.

Furthermore, the groups of claims include distinct classifications under the IPC (eg, H01S 5/183 in relation to the first group of claims, and H01S 3/102 in relation to the second group of claims) and therefore constitute separate search areas, and hence the International Search Authority considered that these inventions could not be searched without involving significant extra effort.

The additional search fee requested was paid by the applicant, and hence all claims were searched.

3. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☒ all parts.
- ☐ the parts relating to claims Nos.

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 3, 5, 7-15, 19-29, 31-32	YES
	Claims 1-2, 4, 6, 16-18, 30	NO
Inventive step (IS)	Claims 3, 5, 8-9, 20, 22-29, 31-32	YES
	Claims 1-2, 4, 6-7, 10-19, 21, 30	NO
Industrial applicability (IA)	Claims 1-32	YES
	Claims	NO

Citations and explanations

Citations

D1 : WO 2001/067563

D2 : US 5301201

D3 : US 2002/0027706

D4 : US 6407854

NOVELTY (N) claims 1-2, 4, 6, 16-18, 30

Claim 1: Each of D1 teaches use of one or more vertical cavity surface emitting lasers to generate pump beams for an optical fiber amplifier (eg, pages 3, 19-21 and claims 29-31 of D1; columns 2-4 and Figure 4 of D2). It is intrinsic to the operation/function of such amplifiers to have waveguide means for receiving input optical signals which are amplified via stimulated emission provided by the pump beams. Hence all features of claim 1 are disclosed by each of D1 and D2, and therefore this claim is not novel.

Claim 2: It is intrinsic to the operation of optical fiber amplifiers to use optical fibres and optical fibre couplers for routing means, as per the additional features of this claim (see also Figure 4 of D2), and hence claim 2 is not novel in the light of each one of D1 and D2.

Claims 4, 6: All additional features of these claims are disclosed by D1, where a lens acts a focussing means and an optical coupler or fibre as a collimating means (eg, page 19), and hence these claims are not novel.

Claims 16-18: D1 discloses all features of these claims (eg, pages 3, 19), and hence these claims are not novel.

Claim 30: D3 teaches control of a pump source, for controlling the optical gains of an optical amplifier, via processing detected signal power and pump power signals, as per this claim (eg, paragraphs 27-33 and Figure 1 of D3). Hence this claim is not novel in the light of D3.

INVENTIVE STEP (IS) claims 1-2, 4, 6-7, 10-19, 21, 30

Claims 1-2, 4, 6, 16-18, 30: as above. It is further considered that claims 4, 6, 16 and 17 lack an inventive step in the light of D2, as the additional features of these claims represent obvious selections for carrying out the teachings of D2.

Claim 7: Monitoring the signal and pump powers is to be an obvious selection for controlling the operation of the optical amplifiers of D1 and D2, requiring no inventive step to implement.

Continued

VI. Certain documents cited

1. Certain published documents (Rule 70.10)

Application No. Patent No.	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
P,X US 2003/0112498	19 June 2003	13 December 2001	13 December 2001
<p>This citation teaches all features of claims 1-4, 6, 12-14 (eg, paragraphs 17-23, Figure 3), and hence these claims are not novel in the light of this citation.</p>			

2. Non-written disclosures (Rule 70.9)

Kind of non-written disclosure	Date of non-written disclosure (day/month/year)	Date of written disclosure referring to non-written disclosure (day/month/year)

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of Box V

Claims 10-15: Use of the pump means disclosed in D1 and D2 for a multi-port optical amplifier is considered to be an obvious application of the teachings of these citations, requiring no inventive step to implement.

Claims 19, 21: Each of D3 and D4 teach detecting pump beam and signal beam powers of an optical amplifier for controlling the pump beam (eg, page 2 of D3 and columns 5-6 of D4), and hence it is obvious for a person skilled in the art of such amplifiers, wishing to control the pump beams of the amplifiers of either of D1 or D2, to use the teachings of either D3 or D4 as per these claims. Hence these claims are not inventive in the light of an obvious combination of any one of D1 and D2 with any one of D3 and D4.

Note that no obvious combination of the prior art teaches or suggests a microlens array as per claim 5; nor a two-dimensional photodetector array as per claims 8-9, 20 and 22; nor the detailed arrayed configuration as per claims 23-29, 31-32. Hence these claims are considered to be novel and inventive over the prior art.

With regard to the document(s) listed in Box VI under "certain documents cited", these are documents published prior to the international filing date but later than the priority date claimed but which would otherwise be considered to be of particular relevance.

Under the PCT, novelty is considered only in respect of documents published before the priority date. The relevance of a document published after the priority date is dependent upon national law. Such documents are excluded from consideration in preliminary examination, under the PCT Guidelines but have been included here for information.